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WHITEWASH & COLD WATER PAINTS

NATIONAL LIME ASSOCIATION
·RELY ON LIME· TESTED BY TIME

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THE attractive Washington, D.C., brick and stone residence pictured on the front cover was built in 1927. Immediately after construction, the outside walls were given a two-coat application of whitewash (Formula 4 as described in this pamphlet). Seven years later, in 1934, another coat of the same whitewash mixture was applied. Except for refinishing dirty spots, such as the chimney and window sills, the walls have received no further attention up to the present time (1939).

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WHITEWASH
and Cold Water Paints

THE information and recommendations in this pamphlet are based largely upon the results obtained from a comprehensive series of experiments conducted by the National Lime Association on whitewash and cold water paints. Considerable study was given to the possibilities for this particular type of paint covering, and new formulas were prepared and tested under actual weathering conditions. A number of these mixtures were found to be not only better, but easier to prepare and more economical than those which heretofore have been in common use. This pamphlet contains a collection of formulas for whitewash which will be satisfactory for a variety of interior and exterior uses. In all cases, best results will be obtained by following the directions given for preparing the surface, and mixing and applying the whitewash.

Preparing the Surface

All dirt, scale, or other loose material should be removed from the surface to be painted by brushing well with a clean, stiff brush, or by scraping first and then brushing. This procedure is necessary especially on surfaces that have been whitewashed previously, since there will be no solid surface to which the new coating can adhere if the old whitewash is scaly.

On the interior walls and ceilings old whitewash or calcimine coatings should be washed off with a cloth or sponge and hot water. In some cases, it may be necessary to use vinegar or a dilute solution of hydrochloric acid to effect complete removal of the previous coat. Grease, dirt, or old wallpaper should be removed with a scraper, if necessary, and the wall should be thoroughly washed with water. Nail holes and cracks should be filled with a mixture of four parts of hydrated lime or lime putty, and one part of plaster of paris, with enough water to make a thick paste. This paste should be forced into the holes and carefully smoothed off flush with the plaster surface by means of a putty knife or old case knife.

The final results and increased life of the new coating will more than compensate for the time and care required to put the surface in good condition. Before applying the fresh coat, the surface should be dampened so that the whitewash will dry gradually. If whitewash is applied to a bone-dry surface, it usually will chalk and rub off rather easily.

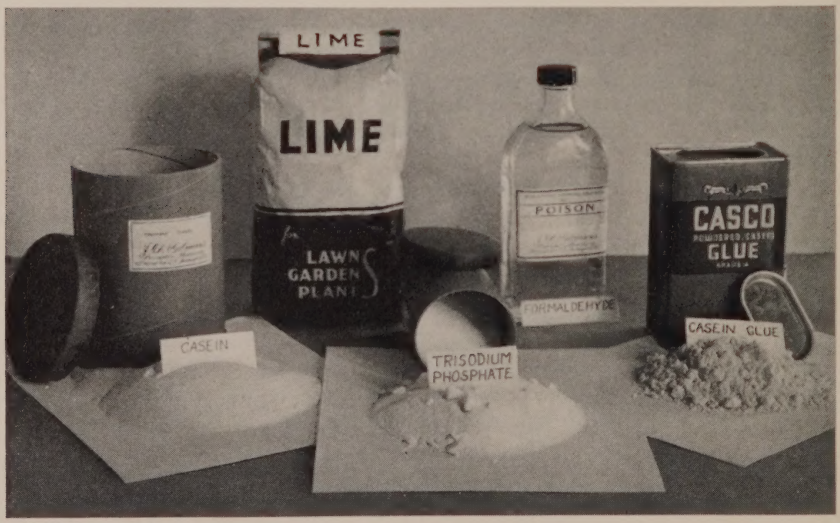
General Directions for Preparing Whitewash

In compounding most of the following formulas either quicklime or hydrated lime may be used for the preparation of the lime paste. For best results the manufacturer's directions should be followed in making this paste by slaking quicklime or by soaking hydrated lime. Approximately 8 gallons of stiff lime paste are produced by slaking 25 pounds of quicklime with 10 gallons of water, or by soaking 50 pounds of hydrated lime in 6 gallons of water.

To remove small lumps of foreign matter which may be present, it is recommended that the paste be strained through a fine screen. This is especially important when the whitewash is to be applied with a spray pump or paint gun on plaster or other smooth interior surfaces.

It is important to remember that casein or glue solutions and lime paste must be cold when mixed together, otherwise an insoluble lime soap will form, thus making the mixture unfit for use. Also when adding formaldehyde the mixture should be cold, and the addition must be made slowly and with constant, vigorous stirring. If these precautions are not observed, there is danger that the casein in the mix will form a jelly-like mass which cannot be brought back into solution.

If casein, trisodium phosphate, or formaldehyde are not readily obtainable, casein glue may be substituted for these three ingredients in the proportion of 5 pounds of casein glue to 8 gallons of lime paste. The casein glue should be dissolved in water according to manufacturer's directions, diluted to a thin consistency, and mixed thoroughly with the lime paste



Ingredients which may be used in compounding Formulas 4 or 5. Casein glue may be substituted for casein, trisodium phosphate, and formaldehyde.

just before using. Do not make up more of this mixture than can be used in one day, as it may deteriorate. Casein glue may be obtained in most paint and hardware stores.

The inability to obtain casein for use in any of the formulas where it is recommended also can be compensated for, in part at least, by substituting skimmed milk for the water. Skimmed milk contains approximately 3 per cent casein, and therefore its use as the vehicle introduces about three-fifths of the amount of casein ordinarily suggested. In this connection, it is preferable to make the lime paste with hydrated lime rather than quicklime, as the heat produced by slaking quicklime with skimmed milk may cause the separation of insoluble compounds.

Whitewash Formulas

1. Salt . . . . . 15 lb.
   Lime paste* . . . . . 8 gal.

   Dissolve the salt in about 5 gallons of water and add this solution to the lime paste. Mix thoroughly and thin to desired consistency with fresh water.

2. Calcium chloride (dry) . . 5 lb.
   Lime paste* . . . . . 8 gal.

   The substitution of calcium chloride for the salt in formula (1) produces a mixture that does not chalk and is quite desirable. The same mixing directions apply.

3. Salt . . . . . 12 lb.
   Alum (powdered) . . . . . 6 oz.
   Molasses . . . . . 1 qt.
   Lime paste* . . . . . 8 gal.

   Dissolve the salt and alum in 4 gallons of hot water and then add the molasses. Add the clear solution to the lime paste, stirring vigorously, and then thin to the desired consistency. This formula produces a whitewash that has a yellow tinge when first applied. However, this color disappears within a few days, and a very white and durable coating results.

4. Casein . . . . . 5 lb.
   Trisodium phosphate . . . 3 lb.
   Formaldehyde . . . . . 3 pt.
   Lime paste* . . . . . 8 gal.

   Soak the casein in about 2 gallons of hot water until thoroughly softened (about 2 hours). Dissolve the trisodium phosphate in 1 gallon of water, add this solution to the casein and allow the mixture to dissolve. Dissolve the formaldehyde in 3 gallons of water. *When the lime paste and the casein solution are thoroughly cool, slowly add the casein solution to the lime, stirring constantly.*

   Just before using, slowly add the formaldehyde solution to the batch, stirring constantly and vigorously. Care must be taken not

*Directions for preparing lime paste are given on page 4.

to add the formaldehyde too rapidly, as this may cause the casein to form a jelly-like mass, thus spoiling the batch. Do not make up more of this formula than can be used in one day, as it may deteriorate.

This formula is recommended highly for most uses, as the coating is white, does not rub or chalk, and is quite weather-resistant.

5. Casein . . . . . 10 lb.
Trisodium phosphate . . . 6 lb.
Whiting . . . . . 25 lb.
Formaldehyde . . . . . 5 pt.
Lime paste* . . . . . 8 gal.

Soak the casein in about 4 gallons of hot water until thoroughly softened (about 2 hours). Dissolve the trisodium phosphate in 2 gallons of water and add this solution to the casein. Add the whiting to the lime paste and when the two mixtures are cold, slowly add the casein-phosphate solution to the lime-whiting paste, stirring constantly. To this mixture, just before use, slowly add the formaldehyde which has been dissolved in 3 gallons of cold water, stirring constantly and vigorously. Do not make up more of this formula than can be used in one day, as it may deteriorate.

Note. In formulas (4) and (5) borax may be substituted for the trisodium phosphate if the latter is not available. The borax mixes are not quite as durable and weather-resistant as those containing trisodium phosphate but will give satisfaction in most cases.

6. Glue (animal) . . . . . 3 lb.
Lime paste* . . . . . 8 gal.

Dissolve the glue in about 2 gallons of water. Add this solution to the lime paste, stirring constantly, and then thin to desired consistency.

7. Carbolic acid (crude) . . . 2 qt.
Lime paste* . . . . . 8 gal.

Add the carbolic acid to the lime paste and then thin to desired consistency.

8. Casein . . . . . 5 lb.
Ammonia (commercial) . 3 pt.
Formaldehyde . . . . . 5 pt.
Lime paste* . . . . . 8 gal.

Soak the casein in about 2 gallons of hot water until thoroughly softened (about 2 hours). Dilute the ammonia with about 1 gallon of water, and add to the casein, allowing the mixture time to dissolve thoroughly. When both are cold, slowly add the casein-ammonia solution to the lime paste, stirring constantly. Just before use, dilute the formaldehyde with about 3 gallons of cold water and slowly add this solution to the lime mixture, stirring constantly and vigorously. Be careful not to add the formaldehyde too rapidly. Thin to desired consistency.

* Directions for preparing lime paste are given on page 4

9. Casein..... 5 lb.
Borax..... 3 lb.
Lime paste*..... 8 gal.

Soak the casein in 4 gallons of hot water until thoroughly softened (about 2 hours). Dissolve the borax in 2 gallons of water and add this solution to the casein. When both are cold, slowly add the borax-casein solution to the lime paste, stirring constantly and vigorously. Thin to desired consistency. Do not prepare a larger quantity of this formula than can be used in one day, as it may deteriorate.

10. Salt (finely granulated)..... 10.5 lb.
Linseed oil (raw)..... 1 gal.
Quicklime..... 150 lb.
Water..... 50 gal.

Mix the lime and water, add the salt, and while the mixture is hot, add the linseed oil with constant stirring. Allow the mixture to age for three or four days and dilute with water before using.

Recommended Colors for Whitewash

There are three factors to be considered in connection with colors used to tint whitewash and cold-water paints; first, that they shall not react chemically with the lime; second, they shall be insoluble in water; and third, the mixing shall be as nearly perfect as possible.

The following pigments may be purchased as dry powders and added to any of the whitewash formulas listed in this pamphlet. The amount of pigment necessary will depend upon the shade of color desired. To be sure that the desired shade will be obtained, it is always advisable to prepare a small sample and allow it to dry before mixing any considerable quantity.

Blacks—Magnetic black oxide of iron is safe. Ivory black and carbon black are non-reactive with lime, but they are lacking in strength.

Blues—Ultramarine and cobalt blue are the only blues recommended.

Browns—Pure precipitated brown oxide of iron or mixtures of the magnetic black oxide of iron with turkey or Indian red are highly recommended. Sienna and turkey umber are lacking in strength, but may give good results.

Greens—Chromium oxide (opaque) or chromium oxide (hydrated) are recommended. These are known as chromium or chrome oxide greens and should not be confused with mixtures of chrome yellow and prussian blue, known as chrome greens, which are not lime-proof.

Reds—Indian red made from pure ferric oxide is highly recommended. Madder lake and toluidine vermilion are alkali fast but have little strength and are fugitive to light.

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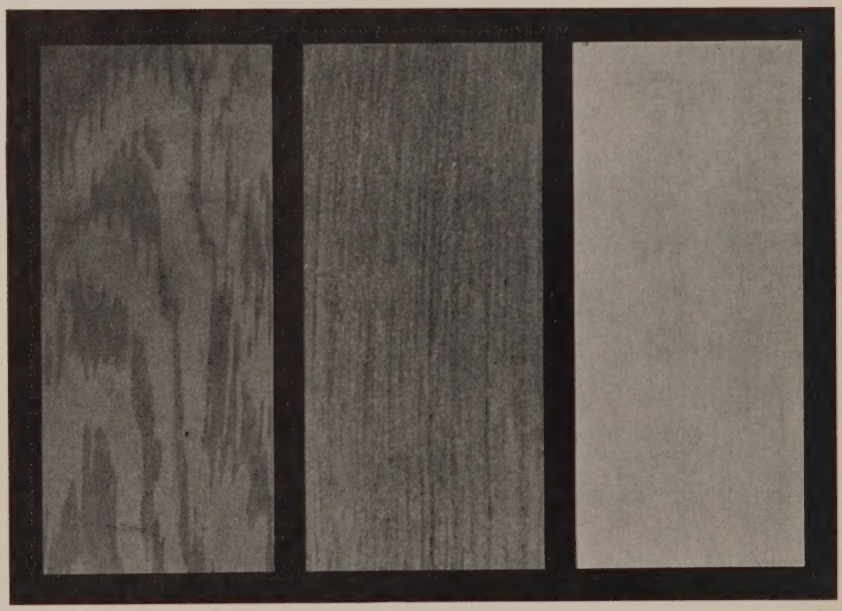
*Directions for preparing lime paste are given on page 4.

Violets—Cobalt violet and mixtures of the reds, whites, and blues suggested are satisfactory.

Whites—Lime itself is satisfactory. Lithopone and ground marble also are used as white pigments.

Yellows—Those made by using precipitated hydrated iron oxides are most satisfactory. Ochre, raw sienna, lemon cadmium, orange cadmium, and golden cadmium are less suitable, as they may change in shade, lack strength, or be affected by light. Chrome yellow is not lime-proof.

Applying the Wash



These three panels (left to right) show the appearance of fir plywood before whitewashing, immediately after application of Formula 4, and after the whitewash became thoroughly dry.

Whitewashes and lime paints should be applied thin, and the surface should be dampened so that the coating will dry gradually. *In fact, best results will be secured if the application is so thin that the surface to which it is applied may be seen easily through the film while it is wet. The coating will dry opaque, however, and the thin coat will give better results than a thick one. A second thin*

coat may be applied over the thoroughly dry first coat if a whiter surface is desired. These cold water preparations can be applied easily and satisfactorily with a large brush. Do not attempt to brush out the coating as is done with oil paint, but simply spread it on as evenly and quickly as possible.

Any of the mixes listed in this pamphlet can be applied with a pressure spray pump or with a paint gun with entire success if care is taken to remove small lumps from the lime by screening.

General Exterior Uses for Whitewash

For the most satisfactory results on the exterior surfaces of all types of buildings where a cold water paint covering is suitable, formulas (4) or (5) are suggested.

For general utility in whitewashing sheds, public service poles, roadside obstructions, concrete masonry, brickwork, etc., formulas (1), (2), or (3) are recommended.

Directions for preparing a satisfactory cold water paint for marking safety zones, traffic guide lines, gasoline station islands, and for similar purposes, are given under formula (8).

Maryland State Highway Formula

The Maryland State Highway Department has used formula (3) for several years in improving the appearance of its highways and for marking obstacles. As noted previously, this whitewash has a yellow tinge when first applied, but this disappears within a few days, leaving a very white and durable coating.

Farm Uses

Formula (4) probably is the best all-purpose whitewash for use around a farm, although formulas (1), (2), (3), (5), or (6) are good, durable mixtures for improving the appearance of exterior surfaces of buildings, fences, trees, etc.

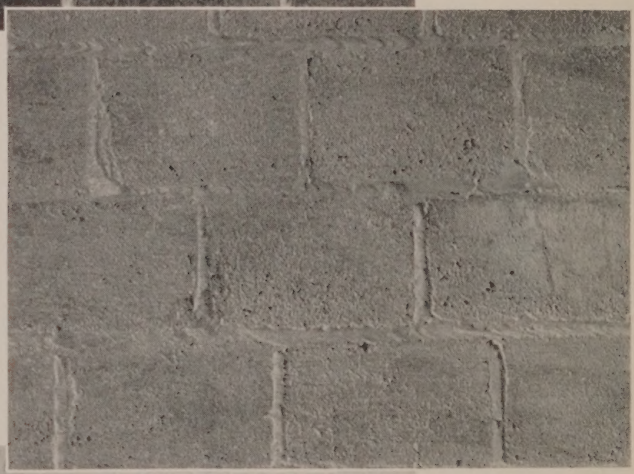
General Interior Uses

Here also, casein-lime mixtures as shown in formulas (4), (5), and (8) are highly recommended, except in basements and other places where there is a tendency towards prolonged dampness. Glue formulas also may prove to be unsuitable under damp conditions, and therefore, mixtures such as formulas (1), (2), or (3) are suggested.

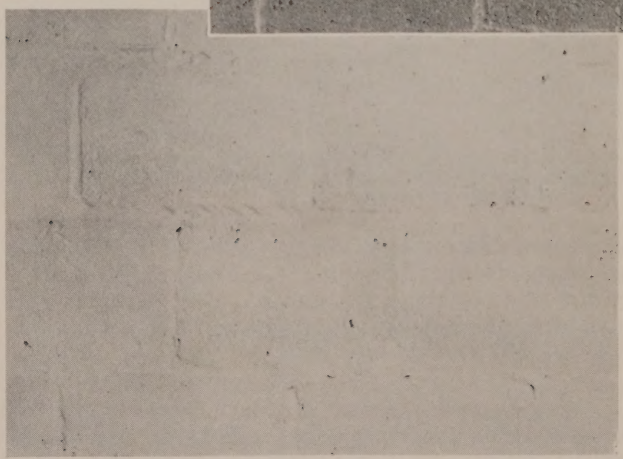
Dairies

For use in dairies or other locations where scaling or chalking is particularly undesirable, formulas (4), (5), or (6) are recommended.

Cinder block basement wall dampened and ready for whitewash coat.



Same wall immediately after whitewash (Formula 4) was applied. Note transparency of coating at this stage.



Same wall showing opacity and whiteness after drying.

Field Offices, Bunkhouses, Etc.

The appearance of buildings of this type can be improved and conditions made more sanitary by a good coat of lime paint or whitewash. As the surfaces in these structures must stand hard usage, the coating should be non-rubbing and durable. Formulas (4) or (6) are recommended except under damp conditions, when formulas (1), (2), or (3) should be used.

Plaster Surfaces

When the surface to be whitewashed is of plaster, formula (4) will be found very good. Formula (5) is somewhat more complicated but gives better results. Formula (6) also may be used satisfactorily under most conditions. This last formula is the easiest to prepare and is also the least expensive of the three.

One of the most important uses of whitewash or cold-water paint is in improving the appearance of interiors. Tinted washes are particularly popular. The results which may be secured easily and economically by using the formulas and data presented in this pamphlet are exceptionally satisfactory.

Special Uses

General Sanitation

Lime often is used to reduce odors and promote a more sanitary condition around poultry houses, stables, kennels, and similar structures. Since all of the whitewash formulas discussed in this pamphlet contain lime, they also are of value for this purpose. Where more pronounced sanitary properties are desired, formula (7) containing crude carbolic acid is recommended. All dirt and debris should be removed from and around structures to be whitewashed to assure a satisfactory job.

Protecting Trees from Frost Injury

With reference to the use of whitewash for protecting trees from frost injury, Oregon Circular No. 103, published May, 1931, under the title, "A Study of Tree Stocks in Relation to Winter Injury and Its Prevention," reports the findings of Childs and Brown at the Hood River Experiment Station. For several winters, starting in 1926, the trunks of young pear trees were protected with whitewash and board shields. During the first two years the percentage of injured unprotected trunks was 79 and 85 per cent. Protected by board shields, 19 and 22 per cent of the trees were injured, and where the trunks were whitewashed only 6 and 10 per cent of the trees were injured.

This experience was checked by the North Carolina Experiment Station during recent months when peach trees were protected against frost damage by applying a coat of whitewash. According to the results obtained, whitewash keeps the trees from 15 to 20 degrees cooler on sunny winter days, holds them dormant, and guards them against the

sudden cold snap sure to come later in the spring. The trees must be kept white throughout the late winter and early spring to be effective.

For frost protection, a good durable whitewash is desired, and formulas (4) or (5) are recommended, although mixtures (1), (2), and (3) may be used.

Fire-Resistant Lime Paint

While whitewash cannot be said to make a structure fireproof, formula (9) has been found to be quite effective as a fire retardant. Its use will prevent splinters and rough surfaces from igniting quickly and, when properly applied, a considerable degree of fire-resistance is secured. Best results will be obtained if this mix is applied with a high-pressure spray pump or paint gun so that all crevices and cracks are thoroughly filled.

Rust Prevention

The corrosion or rusting of metal may be retarded or prevented by applying a good coat of whitewash. A lot of trouble on the farm or in a contractor's yard will be prevented if whitewash is applied to all metal surfaces exposed to the weather, such as plowshares, mold boards, scrapers, picks, shovels, structural shapes, reinforcing rods, etc. If the implements or tools are allowed to stand out in the open, formula (4) should be used, but if stored under cover and not disturbed, a simple lime and water mix will answer the purpose.

Rusting of the inside of furnaces will be greatly reduced if the surface is cleaned and whitewashed at the close of the heating season.

Whitewash for Decreasing Illumination

In the report of the British Building Research Board for the year 1933, a study of the efficiency of whitewash in decreasing the amount of light that passes through glass roofs was presented as follows:

> "In view of the efficacy of whitewash in preventing excessive transmission of solar heat by glass roofs, it has been thought desirable to obtain information as to the amount of light cut off by this treatment. The following experiment was therefore made.
>
> "A lidless box, 20 inches long, 15 inches wide, and 13 inches high, was whitened internally and pierced at one side to allow illumination measurements to be made on the test plate of a photometer placed centrally 2 inches above the floor of the box. The box was placed out of doors on a cloudy day when the lighting conditions were sufficiently constant. The illumination within the box was measured when it was covered first with clear glass and then with whitewashed glass.
>
> "The decrease in illumination was found to be 75 per cent with one coat of whitewash and 92 per cent with two coats."

Cement Water Boxes

The Fontana Water Co. of Fontana, California, has over 1500 cement water boxes on 1900 acres of land. These boxes require a whitewash coat about every two years. The company advises that after experimenting with a number of different whitewash mixtures it found formula (4) to be the best of all by far, because a beautiful white and lasting job results from its use.

Whitewashing Coal

Spraying the top of a carload of coal with whitewash to enable dealers to detect thievery during transit is a practice which it is understood is being followed by a number of coal companies. It is reported that coal thieves and bootleggers have helped themselves to as much as several tons of coal while the cars were in the yards, with the result that dealers were certain the gondolas' cargoes were not of the contents stated in the way bill.

The spraying method is simple and economical. All that is necessary is to give the coal a top coat of lime whitewash (lime and water), after loading and weighing, and then to notify the dealer to that effect.

Whitewash on Asphaltic or Coal Tar Pitch Coatings

Whitewash frequently will be found of great assistance in connection with mop coats of asphaltic preparations such as are used frequently for waterproofing walls, reservoirs, slabs, etc. Where the black surface is exposed to direct sunlight, and particularly in hot climates, trouble sometimes is experienced because of the asphalt softening, which causes the coat to sag and wrinkle, or even to melt and run. This difficulty may be entirely stopped, or at least greatly reduced, by applying a coat of whitewash to the black surface. The formula to be used will depend upon the durability desired. If the exposure is short, a plain lime and water mix will be good, while for longer exposure formulas (1) and (4) are recommended.

In connection with the treatment of enameled pipe lines whitewash serves several purposes. It seems that many soils, when thoroughly watered and puddled around the pipe, tend to adhere closely to the enamel and cause considerable damage thereto when the soil shrinks upon drying. Whitewash acts as a padding between the enamel and clay soil to minimize the damage caused by such shrinking.

The Barrett Company of New York advises that the use of whitewash over protective coatings on steel pipe was developed with the idea of reducing the structural temperatures which would permit more favorable pipe-laying conditions, lessen the effect of expansion and contraction on welded joints, and reduce the possibility of loosely coupled joints where expansion couplers are used. At the same time, the whitewash provides for a sufficient reduction in temperature susceptibility of the coatings to be well within any danger zone because of high temperatures which might cause sagging or sluffing of the coatings. In other words,

whitewash reflects light and heat which might produce a damaging effect on enamel coatings. Formula (10) is recommended by The Barrett Company for this purpose.

Included in the Standard Specifications adopted by the Bureau of Water Works and Supply of Los Angeles, California, is the following clause on whitewash:

> "The outside enamel surfaces of all pipe and specials shall be given a coat of whitewash immediately following a satisfactory outside inspection. The whitewash shall consist of a mixture of quicklime, water, salt, and a vegetable oil plasticizer which shall be furnished and applied by and at the expense of the contractor, and shall be subject to the approval of the engineer."

Cost of Materials

Due to the fluctuations in retail prices, precise cost figures for the various whitewash formulas listed in this pamphlet cannot be given. It has been estimated that formula (4), one of the best and most expensive of those recommended, can be prepared at a cost of from 15 to 25 cents per gallon of whitewash, based upon an average cost of 6 cents a pound for the materials, exclusive of water.

Approximate Covering Capacity

The following approximate figures will be of assistance in estimating the amount of materials required and the time needed to cover wood, brick, or plaster surfaces. It is, of course, to be understood that these figures are only approximate, since there are many factors, such as condition of the mortar joints in brickwork, roughness of lumber, and previous treatments, which will have a very decided influence on the covering capacity of the wash or paint.

A gallon will have about the following covering capacity:

On wood, 225 square feet.
On brick, 180 square feet.
On plaster, 270 square feet.

It has been estimated that a man with a 4-inch brush should cover the following surfaces per hour:

On rough walls, 22 square yards.
On smooth walls, 38 square yards.
On flat surfaces, 40 square yards.
On ceilings, using a step-ladder, 25 square yards.

Other Uses for Lime

Construction—Lime serves to increase the workability and watertightness of concrete; mortars of high lime content are essential in the attainment of watertight walls; lime is recognized as an ideal material for the scratch, brown, and finishing coats of plaster.

Industry—Lime is an essential material in the processing of many commodities used in the everyday life of every individual. Among the many important industries dependent upon lime may be mentioned iron and steel, paper, glass, leather, sugar, paint and varnish, greases, and textiles. The importance of lime in sanitation processes, including the treatment of water, sewage, and industrial wastes, is emphasized by a steadily increasing demand.

Agriculture—In the field of agriculture, lime is used as a soil conditioner; it neutralizes soil acidity, improves tilth, and supplies calcium and magnesium as plant food. Lime is used also in various insecticide and fungicide sprays and dusts.

For further information concerning these and other uses for lime, write to the

National Lime Association

Washington, D.C.

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